

Public Administration for the Next Generation

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Abstract Public Administration incorporates the development of statutes and regulations to bring order and control to aspects of society. In democratic societies this is accompanied by gathering opinion from the population on the span and degree of this control and on some of the details. This essay explores ways in which developments in digital technologies can facilitate this process, aid policymakers in ensuring consistency of regulations, and streamline the process between regulation and software in situations where this is relevant and helpful. It looks forward to what the coming generation of citizens might expect from their public administrators.

Exposition

From the times of Hammurabi, and slightly later, Moses, people have used written law and regulation to guide the focus and interactions within states and communities. Both the law of Hammurabi and the Ten Commandments given by God to Moses were writings in stone and this indicates the degree of consideration given to them and to some extent too the duration for which they were expected to be effective. They were also conveyed in words, and in the case of Hammurabi's Code we know that it was written in Akkadian, the local language of the people, so that it might be read and understood by all – it wasn't in some language only understood by learned judges and civil servants. Another feature that is worthy of note in the case of Hammurabi's Code is the "if this, then that" approach. Specific penalties were appropriate for specified behaviors and acts.

The world of laws and the regulation of society had its ups and downs over the past 4000 years since these early Biblical times, and the process of developing laws and regulations has moved from it being the efforts of one or a small number of people involved in the determination, documentation and publication process to a formidable coordinated effort that in many instances spans multiple organisations and, in the case of trade regulations, many continents. The development of a professional civil service skilled in regulatory policy (Organisation for Economic

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Co-operation and Development 2016a) and practice has moved on from small numbers of scribes and sculptors to large teams covering a very wide range of disciplines and capabilities. This development of a professional civil service hasn't been without its problems. In the United Kingdom, for example, the development of a modern civil service that works with the legislature of the day to provide expert and impartial assistance in the business of government was set on its modern course by the work in the mid-nineteenth century of Stafford H Northcote and Charles Edward Trevelyan that derived lessons learned from the operation of the British government and trading companies in colonial India to develop a set of minimum educational standards, remuneration, and principles of behavior for a professional and permanent civil service (Wikipedia 2016a). The point of the competency is obvious, but sometimes lost on people who see the outputs from the civil service in the area of public administration as being less that of developing a smooth-running machine to being a burden to their ease of living and transacting the business of commerce and, in some cases such as the regulations relating to the public availability of medication, the business of life itself (Australian Government Department of Health 2016). In more recent times the skills and competencies of the civil services in most countries and pan-national organization (e.g. United Nations, European Commission, etc.), together with the routes to expressing their outputs in the area of secondary legislation and regulation have been modernising to adopt digital technologies.

In this chapter I will take a look at the ways in which computing technologies and the Internet are operating within some areas of public administration, and speculate as to the areas for future benefit from more widespread adoption of existing tools and technologies. This is a personal and perhaps predominantly Euro-centric approach rather than a systematic review, but its intention is to stimulate the reader to further investigation and action. The field is extremely dynamic and any review would quickly be getting out of date, but I hope that these views might give impetus to further work in this area.

Development

Reading the Runes

The first part that I am addressing relates to the forces within which any government operates where, as described in the early twentieth century by A.F. Bentley, it is the attitudes and activities of groups within society that will determine the course of government (Lemman 2008). Gauging and defining the interests and activities of these groups is not only the core of the pollsters' art in "reading the runes" prior to any democratic election, but it is also part of the public administrator's required assessment when providing impartial advice to government on the likely impact of particular proposed courses of action (Organisation for Economic Co-operation and Development 2016b). Toolkits such as that used within the UK Government (UK Government 2014) look to include some assessment of both monetized and non-monetized costs/burdens of proposed regulation. In the UK the assessment of

reaction to new regulation was traditionally undertaken by randomized, stratified sampling of opinion in formal surveys combined with consultation with interested parties including representative bodies. The advent of social media and large streams of computer-friendly data has spawned multiple projects and services within government (Mikoleit 2014) to reduce political exclusion, increase the democratic ‘footprint’ of the opinion-gauging and opinion-forming consultation processes, and act as one of the components to improve the efficiency, and effectiveness of service-delivery, amongst other things (Chilean Government 2016). Just bringing the traditional to-ing and fro-ing of information to a greater scale doesn’t really help the poor civil servant who has to make sense of this cognitive overload, and this is where informatics has been starting to provide help. It is also an area where the profession of the civil servant is needing to step up to the challenge by modernising specialist IT divisions (UK Government Digital Service 2016). This is an absolute requirement to make the most of the information available through social media, because although there are tools and framework for extracting topics, sentiment, and relationship amongst social network users and their contributions, the interpretation and the communication of the interpretation in ways that the non-specialist can comprehend are significant challenges (Moss et al. 2015; Pedersen et al. 2014). The timeliness of delivering insight from streams of social media such as Twitter are made possible by the advances in lambda architectures (Amazon Web Services 2015) (that give scope for both analysis of the stream of data and the aggregated data set) and the technology stack is being provided as orchestrated sets of cloud services (Taieb 2016). The key challenges for public administrators are access and validation – are they aware of and ‘allowed’ to use these tools in a timely manner, and can they be sure that the results can be interpreted and communicated accurately?

Policy Engineering

The policy engineering process involves the preparation of secondary legislation, regulations and associated guidance to provide some of the main levers of government. At one time the involvement of engineers and IT specialists in this stage of public administration was to some extent the promotion of self-interest, ensuring that the civil servants were aware of the “facts”.

However, to reap the benefits of these technologies in our everyday lives it is critical that industry, policy makers and the public support their development from ideas generated in the laboratory to the commercial marketplace. (Carnegie Mellon University, Scott Institute for Energy Innovation, Technology Guide 2014)

Increasingly, however, is the realisation that serious negative consequences come from ambiguity and lack of external validation of the integrity of statutes and regulations (DeLong 2002) and this can be mitigated by the application of (software) engineering principles where the purpose of the regulation is clearly stated in a “statement of basis and purpose” (U.S.C. § 553(c) 2006), which is in many ways analogous to the Behaviour Driven Development and Test Driven Development approaches taken in software engineering. “Am I doing the right thing?”. “Am I

doing the thing right?”. This approach would be a step change from the usual usage of scientific computing where scientific or engineering knowledge base is taken into account in the couching of regulation, but neither in testing the drafting of regulation nor in determining consistency within and between regulations – this being the craft of parliamentary draftsmen and other legal experts. There have been several approaches using natural language processing and statistical analyses of natural language to extract meaning from written regulations/policies and converting this into an RDF or UML (Brodie et al. 2006) model in an attempt to validate the consistency of the regulation/policy and assess compliance, but these have the same underlying problem that they are making a best estimate of meaning. This is exactly the same uncertainty experienced with extracting meaning from social media streams. In order to develop a knowledge engineering approach to the crafting of regulation unconstrained natural language is too variable to be used with existing parsing and extraction tools such as UIMA, to give a high degree of parsing accuracy, and, unsurprisingly, having some constraint has been found to work much better (Brodie et al. 2006). Within the domain of legal XML markup, there are moves in the UK to use Akomo Ntoso in addition to the relatively more complex metamodel Crown Legislation Markup Language (CLML) for the markup of legal documents. The Akomo Ntoso model has been shown in comparative studies (McGibbney and Kumar 2013) to be more suited to marking up the end representation of the legislation. A related markup within this area is LegalRuleML (OASIS 2016) which is a specialization of RuleML (RuleML Inc 2016). This is less a presentation markup and more an exchange format for machine-to-machine communication of information (Paschke and Boley 2009). Although there are specific editors, such as LIME (LIME – CIRSFID, University of Bologna 2016), for XML markup of general rules, including policies and regulation, these editors have steep learning curves and the inputs and outputs tend to be difficult for non-specialists, including ordinary citizens, to understand (Beach et al. 2015). Communication of the reasoning underpinning decisions is something citizens have a right to in many countries, as for example in New Zealand (New Zealand Law Commission 2012). This points to the advantage of having a multi-purpose expression format for rules, policies, regulations/statutes etc. that can be understood by both people and machines and be serialized if a form that permits error-free transmission across machine and human interfaces is used. End-users of all types need system interfaces and rule bases that are easy to interact with. These types of interactions might be as part of the development route or feedback loop of policy development and refinement or the formal expression of policy for the purpose of implementation through regulation, and this latter more often than not in the modern world is mediated, at least in part, through software.

Formal Modelling

The work of Wimmer and colleagues in the “Open Collaboration for Policy Modelling” (OCOPOMO) project (OCOPOMO Project 2012) recognizes that there has to be a direct and discoverable link between the narrative texts contributing to

the domain expertise introduced into the policymaking mix and the formal models that policymaking will use. Provenance is important. But so too is the approach for collecting stakeholder input. In the OCOPOMO approach narrative text is the raw material of policy making and from this there is a process of expert interpretation to develop a conceptual model based on the stakeholder textual inputs and other documents. Expert annotation and interpretation by the policy analyst is the key distillation process through which the input becomes crystallised as formal models that permit, through imperative code in “Declarative Rule-based Agent Modelling Software” (DRAMS) the running models to determine the effects of policies, including discovery of emergent behaviours. But DRAMS rules look like computer programme language rather than natural language (Lotzmann and Meyer 2011) and so might be impenetrable to the citizen who provided the original narrative text. The gap between the citizen with domain expertise or stakeholder position and the implementing specialist is perhaps too large to bridge to ensure effective feedback within the policy process.

Pictures of Policy

At the other extreme are approaches to bridge the communication between citizens and policymakers using mainly visualisations. “Policy Compass” (Policy Compass 2016) is looking to Fuzzy Cognitive Maps and other visual widgets and tools as the route to bridging the divide between the citizen and the policymaker. This presents issues of ambiguous interpretation due to the non-standardisation of symbols (unlike e.g. road signs), and the potential disenfranchising of the visually impaired. The development of ‘personas’ within policy modelling (Bennet 2015) is popular within some interested in trying to open up the policy-making process, but although it may provide scope for an inventive workshop, the longevity of the message in the graphic artefacts is questionable. The restricted semantics and semiotics of issue based information systems (Wikipedia 2016b) (IBIS) such as Compendium (Compendium Institute 2012) provide graphics that can be interpreted and the underlying arguments replayed long after they were crafted. I think that the similar level of replay from graphics such as in the ‘personas’ referred to above would be extremely challenging.

The Dominance of Natural Language

Given that across many cultures words are the preferred form communication, a focus on words provides the specificity and longevity required to pass around and debate about the direction and detail of policy and regulation. This is still the preferred way for citizens to respond to government proposals. The commentariat of the US government are prolific though, and Tyrus Manuel describes (Manuel 2015) not only the overwhelming volume of this feedback (e.g. 800,000 public comments to the US consultation on Net Neutrality) but also the palpable relief to some civil servants

as they discover the benefits of natural language processing (NLP) in distilling the core messages (and isolating the “weak signals”) from large volumes of information like this. Manuel sees NLP as a part of the answer.

...We can also use NLP to gain a better understanding of what citizens are trying to tell us on any given issue or in general. It allows for a clearer understanding of items that may need to be addressed, from healthcare to consumer safety. NLPs can help us do a better job of not just listening to the people, but answering them as well.

My view is that persistence with NLP will only shift the problem to elsewhere. There is such a diversity of language that with NLP we don't arrive at a shared representation in a social and democratically consensual way, but are shoehorned into consensus by algorithm and heuristic. One simple improvement to soliciting text input from citizens is to augment it with some fixed sentiments. For example, the website patientopinion.org.uk (Patient Opinion website 2016) gets users to input anecdotes about the workings of the UK health service together with some marked up facts about what was good and what could be improved. This small change is an improvement on machine-determined sentiment, whilst allowing the contributor to use free text. There is also scope for selecting entities from a controlled vocabulary. An extension of this would be the proposition developed in the “Integrated Method for Policy making using Argument modeling and Computer assisted Text analysis” (IMPACT) EC FP7 project to use a controlled natural language for all of the textual input (Integrated Method for Policy making using Argument modelling and Computer assisted Text analysis 2012). There are many challenges in this approach, including tracking the argument both across sentences in the contribution from one individual, and also in the ping-pong of contrapuntal debate. In both these cases incorporation of globally-unique identifiers for ‘things’ and ‘relationships’ – the kernel of the Semantic Web – can provide this continuity. Illustrations of registries such as those for legal entities in the GLEIF project (GLEIF – Global Legal Entity Identifier Foundation 2016), Open Corporates (OpenCorporates 2016) and Open Charities (OpenCharities 2016) combined with identifiers for concepts (ConceptNet 5 2012) and diverse predicates (Linked Open Vocabularies 2016) are providing the Lego™ building blocks for a constrained but rich set of fixed points that can enrich an existing controlled natural language (CNL) approach to describe and comment on policy and statute. Simple “What You See Is What You Meant” (WYSIWYM) interfaces (Power and Scott 1998) have given way in recent years to sophisticated ontology editors such as Fluent Editor (Cognitum 2016) which uses the Ontorion Controlled Natural Language (OCNL) to guide the creation of WYSIWYM documents including ontologies and rules bases (Seganti et al. 2016).

Bridging the Gap

So my line of argument is clearly going in these lines: we need a dialogue between citizens and those who make policy and regulation so that they can understand what is being proposed and make comment in unambiguous ways so that the intent of citizens' comments in relation to proposed legislation are understood. But this has to be

done in a way that copes with computational aggregation and summarization so that the 800,000 responses to a consultation are undertaken and the single thread of argument counter to the 799,999 others is discovered and considered on its merits. The computational capacity and transformational fidelity of controlled natural language allows this, and much more besides. Some of these additional benefits are being played out in work ongoing in the Dutch Finance and Customs Administration (Belastingdienst) where controlled natural language is being used to provide the rule bases that are parsed using ANTLR to an intermediary that can be compiled directly into code. This ability, even in a restricted domain such as finance and customs, to develop software artefacts directly from a human readable set of rules opens up a wide range of new possibilities in public administration. In short, business rules are prepared in “RegelSprak”, a Dutch CNL based on “RuleSpeak” (RuleSpeak 2016) that is fully consistent with Semantics for Business Vocabulary and Business Rules (SBVR) (Object Management Group 2015) and is easily human-readable. As Chris Maple of MMG Insurance (another organization that has adopted CNL rule language deep into its business processes) states, “A lot of really smart people have done really good thinking in this area.” (Maple 2014). The business rules couched in the CNL can then be parsed and compiled into a form suitable for e.g. the DROOLS rule engine.

But just as NLP is not necessarily going to provide the magic wand that allows administrators to get computers to read their input from citizens, so the full-on application of CNL is not going to allow citizens to provide their input to the process of public administration in part because it requires some prior learning, and many people are not going to adapt to that. It also potentially constrains the concepts and constructs that a citizen might be able to use to connect with the administration, and that would be politically untenable as it is likely to be seen as coercive and restrictive. There is potential scope for the scenario where citizens could be using argumentation and debating technologies (IBM 2016) to facilitate constructing their response to an administration’s proposals or actions in the same way that the legal profession has AI tools such as “Ross” (ROSS 2016) at its disposal, but the outputs are still in natural language and so there is an additional ‘layer’ or aspect needed to help people use computers to process more effectively and efficiently the points made and to aggregate them accurately and integrate them into other knowledge accurately and efficiently. Equally, this move to a wholly IT-mediated discourse based on argumentation alone fails to develop the trend to more inclusive and participative democracy that is gaining momentum in countries such as Scotland where recent conversations within the country have recognized that there needs to be both online and offline interactions between government and citizens and the creation of safe spaces for dialogue to help infuse ideas from all sectors of society into the mix, and to mitigate the political risks of “getting it wrong” and the fears that stoke risk aversion in administrations (Stoddart 2014). Collaborative Government that includes administrators going to where the conversations are taking place requires some mechanism of channel discovery, and this again is bringing us to the challenge of scale. How can government monitor the online dialogues to identify which to join? We are back to analyzing Twitter streams and the complexities and hazards of either getting administrators to do this job themselves or using some algorithmic approach.

Ideality?

Smaller populations such as Iceland have the capacity to sample opinion in a much more authoritative and interactive way and this was realized in 2009 and subsequent years during a period of constitutional reform (Bergsson and Blokker 2014). This exercise to update the constitution involved taking a random sample of c.1000 people and getting them to talk about issues and then 25 of this assembly were selected by the voting population (Iceland Review Online 2010) to address the issues identified by the larger assembly and write the revision of the constitution (Wikipedia 2016c). The large group was split into 128 smaller groups and their ideas were condensed into word clouds as a rapid means of determining the topics of interest (Blokker 2012). Clearly this is a circumstance where CNL could not only advance this Icelandic approach but also allow it to scale effectively to larger numbers of participants and provide in computable form greater complexity of input than simple word clouds.

Recapitulation

In summary, I see the incorporation of controlled languages, registries of identifiers and technologies such as RDF and tools for computer facilitated reasoning and discovery/description of arguments as underpinning the next generation of public administration in ways that allow greater individual contribution to the ideas mix from which policy is developed and more streamlined routes to the delivery of IT services that implement and monitor the regulations derived from public policy. I also see these technologies improving the quality of regulations as they provide routes to use computer approaches to test the logical consistency of complex sets of regulation to a scale that Hammurabi could only dream of.

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